

IMPERIAL COUNCIL
OF
AGRICULTURAL RESEARCH

VEGETABLE GROWING
IN THE
DELHI PROVINCE

(Second edition)



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(H.C.)
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FOOD SUPPLY

FOR some time past the food position in this country has been engaging the most serious consideration of the Government of India. The importance of an adequate food supply to meet the needs of the Defence Services and of the civil population is fully recognized in the successful prosecution of the war. No other problem is probably of greater significance during the war.

The normal food supply in the country has been affected by various causes. The most important among these are the virtual cessation of imports, the increasing demand of the growing defence forces and the difficulties of transport. The Government of India, in collaboration with the Provincial Government and the Indian States, have already initiated a campaign to grow more food and fodder crops to make good likely defects in the supplies of staple food grains and fodder. This campaign has aroused wide interest and received great public support. It has been felt, however, that this measure should be supplemented by a similar campaign for growing more vegetables and fruits. The latter campaign will fulfil two purposes. In the first place, it will enable us to make good, to a certain extent, the deficiencies in our principal food crops by encouraging the habit of eating more vegetables and fruits. In the second place, it will help in the evolution of a more balanced and nutritive diet.

It is the urban population which would obviously benefit most by an increased production of vegetables and fruits, for apprehensions of a shortage in food supply are greater in urban areas than elsewhere. The urban population can make an important contribution to the success of this campaign by growing vegetables and fruits in all available lands, for example in the grounds of residences and lands attached to public buildings. I am happy to say that H. E. the Viceroy and some of the Provincial Governors and Ruling Princes have already given a lead in the matter by growing vegetables in a portion of the grounds of their official residences. I sincerely hope that Their Excellencies' and Highnesses' example will be emulated by every citizen wishing to play a worthy part in maintaining the vital food front.

Even a layman would find it easy to grow some vegetable and fruits in any spare land attached to his house, provided proper guidance is forthcoming. With this object in view, this instructive brochure has been compiled by the Department. It gives useful information about the preparation of the soil, the general layout of the site, manuring, seeds, etc. It also provides instructive notes on the cultivation of various kinds of vegetables and fruits in and around Delhi. I feel confident that this small brochure will prove a useful guide to the citizens of Delhi. I heartily commend it to them and also to Provincial and State Governments who are contemplating similar drive to encourage the production of more vegetables and fruits in their own areas.

New Delhi,
28th July 1942

NALINI R. SARKAR

INTRODUCTION

THE population of Delhi Province, as revealed by the census of 1931, was 6,36,246, showing an increase of 30.3 per cent during the last decade. The population in 1921 had already recorded an increase of 18.8 per cent on that of 1911 and it has again increased largely since 1931, as the census figures for 1941 show the population of the Delhi Province to be 9,17,000.* This large increase in population was due mainly to the added importance of the city on account of the transfer of India's capital from Calcutta to Delhi and on account of the import of thousands of workmen from outside for the construction of the city of New Delhi. In 1921, the number of immigrants was 1,82,485; during the decade 1921-31 again immigrants numbered 1,89,594. While immigration had been remarkably rapid throughout the last two decades, emigration has been comparatively small. The natural increase was considerable during the last decade during which the excess of births over deaths accounted for an increase of about 53,000 persons or more than one-third of the total increase during the decade. Feeding of this constantly increasing population in normal times *plus* the feeding of a large temporary population which has accumulated in Delhi due to various reasons connected with the war are, therefore, problems of the first magnitude.

It is true that the area under fruits and vegetables has been on the increase, as will appear from the following figures:

Area under fruits and vegetables (in acres)

	Average for 1911-1919	Average for 1933-1937	Per cent increase
Fruits	1,258	1,438	14.3
Vegetables .. .	875	1,610	84.0

Since 1937 the growing of vegetables and fruits has gained further popularity and it is estimated that in 1939-40 not less than 5,065 acres came under vegetables only. Even then this is quite insufficient to meet the growing demands specially because of the characteristic of the Province, viz that its population is predominantly urban, i.e. consisting of people who have the taste and the money to pay for vegetables which they generally like to include in their diet. (Urban population 70.3 per cent compared to the rural population 29.7 per cent; 1931). It is, therefore, in the fitness of

*Quoted from *Indian Information*. Vol. 10, No. 89, March 1, 1942, page 239.

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things that Delhi is shortly going to have a special week to inaugurate a 'Grow More Vegetables' campaign.

Methods of vegetable growing differ to some extent according to the scale on which it is done. In this leaflet the cultivation of vegetables will be considered mainly from the point of view of small plots though wherever possible hints on the field-scale growing of vegetables will be included.

SOIL AND CLIMATE

The total area of the province in 1938 was 3,68,402 acres and of this 61 per cent represented the cultivated area. The cultivable waste is considerable (17.7 per cent) and it has been suggested that the cultivated area should be increased with a view to reducing the pressure on the land. Generally speaking, the climate of the province is similar to that of the eastern Punjab though the hot weather arrives a fortnight earlier. The rainy season begins about the middle of June and stops by the middle of September. By November the winter completely sets in and extends up to the middle of February. The normal rainfall of the province is 27 inches, a major portion of which falls in the monsoon months and only about 3 to 4 inches in the winter season. There is a considerable local variation of rainfall in the different parts of the province. This is largely due to the proximity of the river and the ridge. The standard soil is the light loam known in the Indian language as *rausli*. It is slightly brown in colour, very light and comparatively soft. When mixed with extra clay it is known as *dakar* which is darker and stronger in texture. It exists mainly in the neighbourhood of Najafgarh Jhil, a low-lying tract in the south-west. In some places the standard *rausli* occurs mixed with sand and this is known as *bhur*. Irrigated land is known as *muhi*, *nehri* or *abi* respectively according as it is irrigated by wells, canals or other artificial sources of irrigation as *bunds*, etc. Unirrigated land which includes more than 59 per cent of the total cultivated area is known as *barani* and it depends solely upon seasonal rainfall. Fruits and vegetables are very profitable crops grown in the immediate vicinity of cities. The Subzimandi gardens supply considerable quantities of orange, plantain, guava, pomegranate, loquat, mangoes *naspatti kamrakh* and other fruits. Vegetables include onions, turnips, carrots, pumpkins, *baigan bhendi*, etc. The cultivation of melons, cucumbers and squashes is a speciality of the Jamna river bed *Singhara* or the waternut is grown in ponds and pools of standing water and is found throughout the province. Delhi is, however, not self-supporting in respect of vegetables. It receives regular supplies from different places in the adjoining districts viz. Meerut, Ghaziabad, Hapur, Panipat, Sonapat, Bulandshahr, Khuraja etc. and certain supplies also come from distant parts like Simla and Peshawar.

II HINTS ON VEGETABLE CULTIVATION

Location

THE vegetable plot is usually relegated to a place apart from the ornamental garden and is generally fenced off by means of a good hedge which serves as both screen and protection. A south-eastern aspect is to be preferred. The plot should be free from trees, open and well-drained.

Layout

The site should be carefully planned, the important considerations being the courses of water channels for irrigation and means of easy access to all parts of the plot. The most convenient way of laying out the vegetable garden is in the shape of a square or rectangle dividing it into plots by means of paths along the sides of which the main water channels can be run. The various crops can then be allotted to the different plots and a rotation of crops can be easily planned. The plan naturally depends on the size of the garden. The land intended for vegetable cultivation may be laid out as :

(a) *Beds*.—For these, convenient sizes of 12 ft. x 6 ft. Each bed should be levelled so that the distribution of water is even :

(b) *Ridges and furrows*.—Ridges and furrows at suitable distances apart, namely 1 1/2 ft., 2 ft., 2 1/2 ft. or 3 ft., are made by hand or with a plough. The usual length of the ridge should be 10 to 15 ft. Tomatoes grow best on ridges with irrigation in the furrows. Broad ridges are very useful for root crops. In these the furrows are opened 4 ft. apart. The top of the ridge is then flattened for planting crops ;

(c) *Basins*.—Basins are prepared at required distances like 4, 6, or 8 ft. for planting crops like gourds, cucumbers, etc.

Soil treatment and manuring.

It is essential for the cultivation of vegetables that the top 2 ft. of soil be thoroughly worked and manured before sowing and that tilth and aeration be attended to while crops are growing.

Cabbages, *kohl-rabi*, broad beans and tomatoes do well on the heavier classes of loam, while broccoli, cauliflower, kidney beans, turnips, onions, garlic, beet, radish and carrot prefer lighter classes of loams.

The ground on which vegetables are grown should be kept continuously hoed and weeds must be kept out very carefully. The soil requirements of individual vegetables have been mentioned

later on in details under each vegetable. In this connection it may be said that too much reliance is often placed on manure and the working of the soil is neglected. It should be remembered that without adequate soil working copious applications of manure and water will not be of much avail.

Well-rotten, dark brown farmyard manure is ideal for vegetable growing. The rate of application is usually half a cartload (400 lb. for an area of 1,000 sq. ft.). Well rotted leaf mould is also a rich manure for vegetables. Manure is best applied when the land is being prepared and it should be thoroughly mixed with the soil. It is imperative that the manure used should be well decomposed. The prudent gardener always obtains his store of manure in advance of his requirement. He then digs his vegetable plots immediately after the first monsoon rain and spreads his stock of manure over the surface of the soil and mixes up the manure with the soil by constant diggings. Green-manuring may also be practised. This consists of sowing a quick-growing leguminous crop and ploughing it into the land or incorporating it into the soil by digging it in. A dressing of lime immediately after ploughing in the green crop gives good results. Another point of importance to remember is that as soon as any crop has been collected from the vegetable garden, plants left in the plots should be cut down and dug into the soil instead of allowing the stumps to remain and become woody. A limited supply of manure is available at the Government Nursery, but there is a large demand for this manure. Then there are contractors who deal with manure supply to the residents of New Delhi. Their rates are, however, higher than those of the Government Nursery. It will therefore, be necessary to get one's supply of manure if he is a resident of New Delhi from outside at the beginning. In some parts of New Delhi there are itinerant traders who bring farmyard manure from the suburbs and sell it to the residents of New Delhi and Delhi city.

The Engineer, Delhi Joint Water and Sewage Board, New Delhi, can supply digested sludge which is a strong nitrogenous manure. Before use, this should be powdered up and mixed with the same volume of ordinary earth and the mixture then used as if it were farmyard manure. When this sludge is watered it gives a slightly unpleasant smell for a few days which gradually passes off. The sludge may also tend to make the soil surface slightly green and sticky, a condition that may be overcome by additional hoeing.

Raising of seedlings

For the preparation of seedlings, raised seed-beds a few inches above the ground are the best. The width should not be more

than 3 to 4 ft. and the length should be about 5 to 6 ft. Manure is to be applied to the seed-bed at the rate of one basket for 15 to 20 sq. ft. Seeds should be sown thin in lines 4 in. apart. Hand watering should be just enough to keep the bed moist and should be done daily in the morning or evening till germination sets in. After the seedlings have set and begun to grow watering need not be given daily. Insects, if any, should be collected and killed.

Irrigation

Successful vegetable culture is only possible when there is an abundant water supply. The amount of water required depends on the soil, prevailing weather conditions and the quality of the tillage. Irrigation should be thorough without being too frequent and given as required according to the condition of the soil. A practical tip to remember is that an adequate irrigation should be such that it will permit of hoeing or stirring with a *khurpi* after 24 hours in the hot weather and after 48 hours in the cold weather. After each watering the surface soil should be loosened and pulverized and weeds removed in the process.

Weeding

This should be done frequently to keep the plots clean and to aerate the soil.

Insect attacks.

Caterpillars should be handpicked and destroyed. For *aphis* green fly spray with a tobacco solution made of 1 lb. of tobacco dust steeped in two gallons of water for 24 hours, strained through cloth and then mixed with another two gallons of water.

Rotation

There are several reasons which make it advisable to grow a succession of different crops on a particular plot of land. Different groups of plants vary considerably in their food requirements and some of them remove large quantities of particular element and a little of another. A suitable rotation would, therefore, allow for an even tapping of the soil resources. Similarly, it may exert a beneficial effect on the soil as deep-rooted crops grown in the rotation assist in opening and aerating the lower layers of the soil. A system of rotation also assists materially in reducing the attacks of destructive insect pests and fungoid diseases. Lastly, it prevents the accumulation of injurious secretions in the soil from plants of the same family continually grown on the same plot. In practising a rotation, the point to remember is that plants of the same family should not be continually grown in the same plot. Thus chillies, brinjals, potatoes and tomatoes belong to the same

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family and plots carrying these should alternate with other varieties of vegetables. Labour for the digging operations, spreading of manure and such other jobs so common in a vegetable garden is generally cheaply available round about New Delhi and in most cases certain items of vegetable gardening can be worked by hired labourers under the supervision of a *malik*.

General

The following additional points may also be noted :—

(a) Seeds with tough coats require soaking in water before sowing. The depth of sowing varies with the kind of seed. Pea and bean seeds should be sown 3 in. deep, while only a very light covering of less than a quarter inch of loamy soil should be put on celery or lettuce or cabbage seed.

(b) Seeds are best sown in raised and well-pulverized seed-beds which have been adequately manured. Light shade may be given and protection when necessary from heavy rains, but if light is too much reduced the seedlings are long and weak. Ashes may be thinly sprinkled on the seedlings as soon as these appear. This helps to keep off insects.

(c) Water is to be given by a watering can with a fine 'rose' as occasion requires.

(d) When there are four to six leaves on the seedlings they are ready for transplanting.

(e) Before transplanting, the seed-bed should be well soaked with water. For transplanting, a dull or showery day should be chosen if possible or else it should be done after a shower of rain. The plants are to be set a little deeper in the soil than their depth in the seed-bed and the soil round the roots should be made firm with the hand, taking care not to bruise the plants in any way. The plants should never be pulled up from the seed-beds but always lifted up with a little soil adhering to the rootlets. A small *khurpi*, can be used for this. Watering all the transplanted seedlings should be done two or three times or oftener a week early in the morning or late in the afternoon until these are well established. While transplanting, weak, diseased and insect eaten seedlings should be discarded.

(f) Spacing differs with different vegetables and a proper spacing for each vegetable has been given later on while dealing with the detailed cultivation of each kind of vegetable.

(g) Quantity of seed required per acre :

(This is given below for those who want to grow vegetables on

a field scale). Quantities for small plots have been mentioned later on under each vegetable.

Brussels sprouts, broccoli, and parsely	2 oz.
Cabbages	4 oz.
Onion (sets)	1 md.
Onions and carrots (seeds)	8 oz.
Radish	8 oz.
Leek and calery	1 oz.
Lettuce	3 oz.
Turnips and parsnips	8 oz.
Beet	2½ sr.
Pease and beans	1 md.
Country peas	15 sr. (4½ md. if required for fodder)
Jerusalem artichoke (bulbs)	5 md.

(h) Proper irrigation is essential and whenever the land looks dry, water must be given to the plots and irrigation should be followed each time by hoeing.

(i) It pays to get good seed as good results cannot be expected from inferior seed. A partial list of seedsmen has been appended (Appendix). Certain varieties have been named in the sections dealing with individual vegetables. This does not mean that such are the only varieties recommended, as all seedsmen have good varieties which they can supply and which are listed in their catalogues. Later on a good deal of the seed requirement can be met by setting aside a few plants of each kind of vegetable for seed production. When it is desired to grow seed from root crops, the best-developed roots are taken and the lower half cut away entirely; the top halves are then planted out in rich soil where they will form roots and flower.

Seeds of the more important imported vegetables are obtainable in three strains, namely early, mid-season and late. To obtain a good succession of vegetables, all these three strains should be sown. The most important point is to sow the right seed at the right time and for this the best plan is to follow the advice of the seedsmen with regard to the time of sowing the seeds supplied by them. The dealers' instructions should always be sought and carefully followed. The entire supply of seed should not be sown in one sowing. Successive sowings will give a succession of vegetables extending over a long period.

(j) All vegetables of a climbing habit should be given some sort of support.

(k) During the cold weather if frost is considered imminent, plot should be irrigated liberally as watering partially counteracts the effects of frost.

(l) If there is a large-scale drive for growing more vegetables, farmyard manure may become difficult to obtain cheaply or even scarce. It is, therefore, a good plan to compost all waste vegetable matter, including dead leaves, either in heaps or pits.

To make compost, a layer 6 in. deep of vegetable waste is covered with a layer 1 in. deep of farmyard manure or Okhlanite (a mixture of activated and digested sludge) from the place Okhla obtainable from the Engineer, Delhi Joint Water and Sewage Board, New Delhi, then a sprinkling of wood ashes. Similar layers are built up to a total height of 3 ft. in a pit or heap, watering being given as each layer is added. After ten days, the mass should be turned and more water given and turning repeated at intervals of ten days for a month after which the material should be left alone for another two months. At the end of a total period of three months, the compost should be a rich brown manure and equal to farmyard manure in its effect.

III

NOTES ON THE CULTIVATION VEGETABLES

VEGETABLES which can be grown in Delhi may be divided into the following classes:

- (A) Beans and peas.
- (B) Tuberous and root vegetables, e.g. carrot, beet, radish, potato, turnip, sweet potato, etc.
- (C) Gourds and pumpkins, e.g. *karela*, *lohi*, *kumra*, *tori*, *ghia*, *petha*, etc.
- (D) Fruit vegetables like brinjals, chillies and *bhendi*.
- (E) Salad vegetables, e.g. lettuce, mustered, tomato, celery, cress, etc.
- (F) Leaf and stem vegetables. Under this head come cabbage cauliflower, garlic, kohlrabi, spinach, onion, *poi*, etc.
- (G) Flavouring and seasoning vegetables, e.g. coriander, ginger, mint, parsley, etc.

A. BEANS AND PEAS

Beans (Local name *Sem*)

Included in this group are a number of different varieties, as for instance Lima bean (also called Double or Butter bean), Broad bean (*bakla sem*) French bean (*vilaiti sem*), Asparagus bean (*lobia*), Sword bean (*bana sem*), Country bean (there are a number of types

within this and of these *makhani sem* is the best), Velvet bean (*udu sem*) and Goa bean (*charkani sem*).

Soil and varieties.—Beans require a soil that is not too rich. Light brown to medium black well-drained soil suits beans very well. For Lima beans the field is laid out into ridges and furrows 4 ft. apart and two seeds are dibbled at a distance of 2 to 3 ft. in a row. The Broad bean can be sown during October and November, the French or Kidney beans from August to the middle of October. The Runner beans are all more or less tall climbing plants requiring supports and these can be sown any time from August to October. The Sword bean is also a climber and can be sown in June and July. The indigenous bean known as *ghia* or *makhani sem* is sown in May and June. There are numerous sub-varieties the chief difference lying in the shape and texture of the pods. Varieties of which the pods have smooth skins are preferred. The Goa bean has a four-sided pod and can be grown during the rains. The asparagus bean or *lobia* is a climber and is sown in June and July.

Tillage.—The land is well dug to a depth of 1 ft. Clods are broken and the bed brought to a fine condition.

Manuring.—About half a cartload of farmyard manure is applied at the time of the preparation of land and this quantity is suitable for a plot of 1,000 sq. ft.

Seed and sowing.—For Lima bean, the seed-rate comes to about 3 oz. for a plot of about 1,000 sq. ft. and the planting may be done in June-July. For Broad bean, 1 lb. of seed is sufficient to sow 80 sq. ft. and the seed should be 1 in. apart in the row, the rows being 2½ ft. apart. French beans are generally sown in rows 1½ ft. apart the distance between plants in a row being 1 ft. or less. A pound of seed would be enough for a plot of 1,000 sq. ft. Runner beans do well in rows 4 ft. apart, the distance from plant to plant being 1 ft. Country beans should also be grown in rows 5 ft. apart, the distance from plant to plant being 1 ft. The same distance holds for Goa bean, Velvet bean and Asparagus bean—Sword bean does well in rows 5 ft. apart, the distance between the plants in a row being 2 ft.

Irrigation.—Irrigation is given after the rains are over, once in seven days or at shorter intervals if the condition of the soil requires it.

After-care.—The climbing beans should be given supports so that the growth of the shoots is properly encouraged.

Harvesting.—French bean pods are formed after about eight

weeks. Tender pods are harvested. The harvesting period for French bean lasts four to five weeks and 100 to 150 lb. of pods are obtained from a plot of 1,000 sq. ft. The tender pods provide an excellent vegetable. The fruiting period of the Asparagus bean is August to April, while that of the Sword bean is September to December. The Country bean has a fruiting period from September to March but does not bear well if the weather gets very cold. An important point to remember when growing broad bean is that when the plants come to flower the breaking of the end point of each shoot encourages the proper setting of the flowers into pods. The tips thus nipped off may be used as a vegetable like spinach. Gathering the pods before their seeds begin to harden prolongs the period of bearing of the plants.

Varieties.—There are a large number of varieties of all the different kinds of beans available with different seedsmen. Thus Sutton's Mammoth Longpod is the earliest Broad bean of great size. Carters provide a mixture of early and late varieties of Runner beans. Poochas offer Red-seeded and White-seeded *lobia* and flat beans which are good.

Peas (Local name *Mutter*)

Peas require a cool climate. Of peas, there is an endless variety of both tall and dwarf kinds. They are easily acclimatized and do not deteriorate for years.

Soil.—Peas like soil of a light nature and one that is well drained. The land is dug deep and the clods broken and well pulverized as in the case of beans.

Manuring.—Half a cartload of farmyard manure is sufficient for a plot of 1,000 sq. ft. and this is applied when preparing the land.

Seed and sowing.—Pease are generally sown in October-November in rows 2 ft. apart for the dwarf varieties and 4 ft. apart for the tall ones, the plants being 4 in. apart for the dwarf varieties and 6 to 9 in. apart for the tall ones. To sow a linear row of 100 ft., 1 lb. of seed will be sufficient. Germination is hastened by soaking the seed in water before sowing. A crop of pea requires proper staking and as in the case of beans the yield is increased if the leading shoots are pinched off after the flowers have appeared.

Irrigation.—This is given as required once in seven to ten days.

Harvesting.—Plants come to flower after about eight weeks. Flowering, fruiting and harvesting continue for about six weeks. Well filled up medium grown pods are to be plucked. The produce is roughly 100 lb. green pods from a plot of 1,000 sq. ft.

Other points.—When the plants come into bearing, they should be copiously watered, because this keeps the pea tender and prevents it from ripening too soon. It is desirable to sow several series of seeds in succession in order to have a prolonged harvest. Pea seeds can be kept easily and it is a good plant to keep aside a part of the crop exclusively for seed purposes. The straw left after the harvest of pods provides a valuable fodder for cattle.

Diseases.—Peas are almost always attacked by mildew when the pods are being formed. Sulphur dusting is the remedy. When attacked by aphides, spraying of tobacco dust extract prepared by steeping tobacco dust in water will be found to be useful.

Varieties.—There are innumerable varieties of peas. Carters' Eight Weeks is the earliest dwarf pea in the world and is ready approximately in 56 to 66 days. Carters' Generosity is a good example of dwarf early pea. Carters' Quite Content is a good main crop variety. Suttons have also a number of earlies, second earlies and main crop varieties to offer.

B. TUBEROUS AND ROOT VEGETABLES

Carrot (Local name *Gajar*)

There are usually three kinds of carrots: the long, the short and the blunt-shaped. They are best sown on ridges and should be ultimately thinned out to 6 in. apart.

Soil.—Light soils are usually preferred. The land is dug several times, and when grown on a field scale, properly ploughed and harrowed and finally brought into good condition. This vegetable, specially the long-shaped form, requires a deeply worked soil mixed with plenty of farmyard manure up to a depth of 6 to 15 in. Carrots, however, should not be planted on recently manured land, because the roots coming into contact with raw manure become mis-shapen.

Seed and sowing.—An ounce of seed will sow a drill 120 ft. in length. The seed is light and very slow in germination. The time of sowing is from August to November. Seeds should be sown broadcast in beds and should be mixed up well in the soil with the help of a rake.

Irrigation.—This should be applied very lightly.

Harvesting.—Carrots will be ready for pulling $2\frac{1}{2}$ to 3 months after the seeds have been sown. Well-grown but tender roots are pulled up at harvest.

Other point.—Soot can be applied to carrots with advantage. The proper way to apply soot is to expose it to air for a month and

then dust on the soil every 15 days after the carrot seedlings are 2 in. high.

Varieties.—Sutton's Champion Scarlet Horn and Early Gem are very good and popular early varieties. In the main crop series Sutton's New Red Intermediate gives good results. For home gardeners, who like to have fresh, tender and tasty carrots all over the season, Coopers offer seed packets of mixed table carrots.

Beet (Local name *Chukandar*)

There are several varieties of beet, but these perhaps vary more in form and colour than in flavour. The test of a good beet is that when cut the white woody rings should be inconspicuous and the red succulent portion should predominate.

Soil and tillage.—The soil for beet should be deeply cultivated and pulverized so as to be free from all lumps of earth and manure. On badly prepared land the roots will be deformed.

Seed and sowing.—It is generally sown from the middle of August to the end of October. An ounce of seed is sufficient for a row of 50 ft. Thick sowings should be avoided and the seedlings should not show up closer than an inch apart and these may then be thinned out to the required distance. If sown in rows these should be 12 in. apart and the seedlings should be thinned out to 9 or 10 in. between plants later on. The seed usually germinates in three days. Good results are obtained by successive sowings at intervals of a fortnight.

Harvesting.—The harvesting period for beet is November to April.

Other points.—Beet is benefited by an application of ordinary salt. This can be worked into the surface soil at the rate of 1 oz. to a square yard 15 days before sowing.

Varieties.—For early use Carters' Crimson Globe is good. Sutton's Globe is a fine strain of the globe-shaped variety. Sutton's Blood Red is a good strain of long beet. The early sowings should be of the acclimatized seeds, while the later sowings should be of imported seeds.

Radish (Local name *Mooli*)

There are three principal kinds of radish; the long-shaped, the oval-shaped and the turnip-shaped. Both the red and the white varieties are commonly grown in Delhi. The long-shaped white is the most delicate variety.

Soil.—Like all root crops, radish requires a deeply dug soil.

If the soil is of a close nature, it can be made lighter by adding wood ash. As in the case of beet, it should not be recently manured. A partially shaded situation is advantageous.

Manuring.—Half a cartload of farmyard manure is sufficient for a plot of 1,000 sq. ft.

Seed and sowing.—Two ounces of seed will be sufficient for a plot of 1000 sq. ft. The sowing may be broadcast but the more economical method is to sow in drills. The drills should be in rows 6 in. apart and the seed should be buried in them a quarter of an inch deep. After sowing, the ground should be well compressed as otherwise the roots will not be well formed. The seedlings may be thinned out to 4 in. apart. Seed may be sown at intervals from August to January. The sowings made in October produce the best stuff for the table. For a constant supply of young roots sowings can be made at intervals of 10 to 15 days.

Irrigation.—Radish requires lots of water and the soil should be kept constantly weeded.

Harvesting.—Roots, will be ready for pulling in about four to five weeks. Roots, the top of which appear above the ground, should be pulled up. Radish should be pulled out in the morning, cleaned and used the same day.

Yield.—About 150 lb. of roots and leaves are produced per 1,000 sq. ft. Roots, leaves and pods are all eaten. The indigenous varieties are generally inferior in quality and some of them are mainly cultivated for the pods which are cooked and eaten. When grown for seed purposes, the best-developed roots are selected from the October sowings. One-third of the root is cut off leaving the upper two-third for planting. The leafy top is also cut away. These crowns are then planted 3 ft. apart each way in a rich soil and these then produce pods in due course.

Varieties.—Of the turnip-shaped varieties, Sutton's large crimson and Red White Tippe-l are good. Of the Indian varieties, Contai Short and Contai Long will be found to be useful. Cooper's Queen of the market is an excellent home and market garden radish. Seed packets of mixed radishes are also offered by Coopers for the home garden where space is limited and with these one sowing is all that is required for a continuous supply as the root become ready for table use in 30 to 65 days.

Potato (Local name *dhū*)

This is undoubtedly the most valuable edible and tuber among vegetables the most generally consumed. Potatoes are best

cultivated in the cold weather as an irrigated crop and is very sensitive to excess of moisture in the soil.

Gola of Meerut and *Phulwa* of Farrukabad are commonly grown in Delhi. The former is early, but the latter is very heavy yielder.

Soil.—The most desirable soil is a light loam richly manured and in which wood ashes, lime and bone dust have been well incorporated. It is a good rule not to grow potatoes on the same plot for several years in succession.

Manure.—Well-rotted farmyard manure at the rate of half to one cartload for a plot of 1,000 sq. ft. should be given according to the nature of the soil at the time of the planting.

Planting.—Propagation is done by means of tubers which are planted from the middle of September to the end of October. Tubers are planted about 24 in. apart, either whole or cut according to their size. When whole tubers are used for seed purposes it is now generally agreed that the best tubers for planting are the medium-size ones, i.e. those that are about 2 in. in diameter. The seed-rate is about 30 lb. for a plot of 1,000 sq. ft. The tubers when cut into several sets should be such that each set has at least two eyes. In planting, furrows are opened 12 to 15 in. apart. The depth of the furrows is 4 in. Manure is spread in the furrows and sets are planted on the manure, the buds facing upwards. The distance between two sets is 9 in. After planting earth up the sets and give water in the new furrows made between the earthed up lines.

Irrigation.—The crop requires to be irrigated immediately after planting. The second irrigation is given after 15 days and subsequent irrigation should be given after eight to ten days. The crop matures within 3 to 3 1/2 months. After each watering the soil should be well loosened. The crop requires to be weeded for the first time a month after planting. A second weeding is required as soon as weeds appear again. As the plants grow, they should be earthed up and a good crop depends on this being carefully done. The first earthing is generally done with a *kudali* six weeks after planting. This covers up the tuber as otherwise the exposed ones turn green and are attacked by borers.

Harvesting.—The crop reaches maturity when the stems begin to wither and the leaves dry up. At this time watering should be stopped altogether. The crop is generally harvested by means of a small wooden plough or dug by hand. The exposed tubers are picked up by hand.

Yield.—This depends on a large number of factors and is

generally about 250 lb. for a plot of 1,000 sq. ft. or roughly eight times the seed-rate.

Other points.—The potato can also be grown as a *kharif* crop. For this season hill seed, known as *Luthia* is preferred. It resembles *Phulwa*.

Turnip (Local name *Salgam*)

There are several varieties of turnip and one generally finds in the market some remarkably fine specimens of this vegetable. The red and white turnips are commonly grown in Delhi. The former is early, while the latter is a late crop. Good acclimatized varieties are preferable to the imported ones. The latter are difficult to grow and are very susceptible to the attacks of insects. Turnip is essentially a cold-weather crop.

Soil.—The best soil is a rich, well-cultivated soil in an open situation. The land should be well prepared by several diggings and the clods broken and finally pulverized for the preparation of a good tilth.

Sowing.—Acclimatized seed can be sown from July to September and imported seed in October. To ensure a continuous supply for the table, successive sowings must be made every 20 days. Cultural instructions are about the same as for beet and carrots. Seeds may be dibbled half an inch deep and 12 in. apart and 1 oz. of seed will sow a row 150 ft. long. The sowing may also be made broadcast, in which case to secure evenness, seed should be mixed with four times its bulk of dry sand before it is broadcast. Crowding of plants should be avoided as otherwise tubers do not form properly.

Cultivation.—To be tender and tasty, turnips must be grown quickly and without any check in growth. During the dry weather plenty of moisture must be made available to the plants. Turnips grown with insufficient water become exceedingly strong in flavour and if growth is checked by drought the roots become stringy and tough.

Harvesting.—The crop should be lifted as required. If ready the roots may be lifted and stored in sand. Turnips take six to eight weeks from the time of sowing to be ready for the table.

Yield.—The produce is generally 400 lb. per 1,000 sq. ft.

Sweet potato (Local name *Shakarkand*)

Soil.—Light sandy soil not too richly manured suits it best.

Planting.—Both cuttings of the creeper and more often, tubers are planted to propagate the sweet potato and this is done during the months from March to July. The plants should be $1\frac{1}{2}$ ft. apart from one another in rows which are $1\frac{1}{2}$ ft. distant. Cuttings are planted *in situ* in June or as soon as the rains have set in. There are two varieties—one with red tubers and the other with white. The latter is regarded as the better of the two.

After-care.—Sweet potato is easily grown without any great care. The plant which is of a trailing habit is allowed to spread itself over the ground. The vines should, however, be cut back half their length once or twice during the growing period as this induces thicker tubers.

Harvesting.—The crop is ready in three to four months from planting. When the vines begin to turn yellow, all watering should be stopped and when the tubers are properly filled these should be taken out. Ripe tubers should not be allowed to remain in the ground. These should be pulled up and stored in dry sand in an airy room.

Artichoke (Jerusalem) (Local name *Hatipich*)

This is a tuberous root plant and lasts for three to four years. It provides a delicious vegetable and is cultivated successfully in most parts of India. The tuberous roots are the parts used for the table and are in season in November.

Soil.—Artichoke (Jerusalem) can be grown in almost any kind of soil but it prefers a light, deep soil. The land should be well dug and pulverized to a depth of 12 in.

Planting.—It is grown from tubers which are generally planted during April. The tubers are generally planted about 18 in. apart in rows. The rows are generally 2 ft. apart. The plants grow to 3 or 4 ft. high. Flowers should not be allowed to appear as these reduce the size of the tubers. It is, therefore, a good plan to nip off about 6 in. of the tops as the buds begin to appear. The tubers are fit for use by November.

Cultivation. The ground between the rows should be kept well hoed and free from weeds.

Harvesting.—The crop is ready for harvesting when the tops die back. The tubers wilt in dry weather and it is best to leave the tubers in the ground until required for use.

Globe Artichoke (Local name *Hatichuk*)

This is propagated from seed. It is preferable to sow freshly

imported seed; although acclimatized seed gives good results. It shows signs of degeneration after two years. It can also be propagated by suckers.

Soil.—It requires a very rich soil to grow *Artichoke* to perfection. It also requires lots of water.

Planting.—It is usually grown in trenches which have been deeply dug and manured. The seed is sown in nursery beds. When the seedlings are about 4 or 5 in. high they should be carefully taken out and transplanted into the trenches at about 3 ft. apart. Application of salt to the soil at the time of preparation is advantageous. Surface soil should be kept constantly stirred. Sowing can be done any time between mid-August to October. The seed germinates in about 10 to 12 days. The seedlings are best planted out when about a hand high.

Harvesting.—The harvesting period is from March to April. Flower heads should be cut down when half-grown. If these are allowed to mature, the crop is reduced.

Parsnip (Local name *Istuseen*, *juzur*)

The soil which suits parsnip best is of light and sandy nature, mixed properly with good farmyard manure. The ground should be well and deeply dug and the plot should be in an exposed position because the crop does not like shade. The soil should be rich and comparatively free from stones, so that the root is able to penetrate it easily. The seed can be sown in drills and then thinned out. The crop requires lots of water. The seed can be sown in October and November. The crop attains maturity in five months but those roots which are about two-thirds grown are the best for table use. The general treatment of the crop is the same as that for carrot or beet.

Salsify

This plant is not commonly grown. It can be sown in October on ground which is well broken up by several deep diggings and suitably prepared. The seed is sown in drills and thinned out to 6 in. apart. Treatment is much the same as for carrots.

Arvi or Ghoyan

This is a favourite vegetable and the mode of cooking is to pare it and fry in *ghee*. It is cultivated much in the same way as Jerusalem artichoke. The ground is well dug and broken up to make it loose and furrows are drawn across it 14 in. apart and 4 to 5 in. deep. In these small tubers set aside for the purpose are laid

14 in. apart and covered with soil. Irrigation is required every four days. The crop requires rich garden land or sandy loam which can take a good deal of manure. The seed rate is 600 to 640 lb. of tubers per acre and the yield is 8,000 to 10,000 lb. per acre. Young leaves are also eaten. The crop is generally sown from April to June and the harvesting is in September and October. Earlier crops are also grown the produce of which come into the market in July. The average outturn is 100 md. per acre.

C. GOURDS AND PUMPKINS

The vegetables in this class are greedy feeders. While they can be grown in ordinary soil and can produce good crops, they readily respond to liberal application of manure. Farmyard and other organic manures are best suited to these crops. They also require copious watering and unless there is a plentiful supply of water, especially during the dry weather, they do not grow to perfection. Their greatest need for water is during the growing period, i.e. before they come into flower. Most gourds are of trailing habits. Many varieties will permit of sowing both during the dry and the rainy season. Others grow during the dry season only and yet others succeed only during the monsoon. The seeds should be sown in moist soil and no further water should be given until the plants are a couple of inches above the ground when they will require a copious supply of water. All gourds are attacked by beetles of various kinds. These insects attack both the foliage and the flowers and the best remedy against them is to pick them up by hand and destroy them. As a preventive, wood ash freely sprinkled over the plants first thing in the morning, when the crop is wet with dew, will be found to be advantageous.

Bitter gourd (Local name *Karela*)

There are two distinct varieties—the hot season variety and the rainy season variety. The fruit of the former is smaller than that of the latter, otherwise they are about the same in appearance. The seed can be sown from March to the end of July. The crop requires a light, rich soil. The common sowing time, however, is at the beginning of the rains. The plant has rather a pretty appearance with its bright yellow flowers and little blunt fruits grown with tubercles. The fruit is best used green though ripe fruits are often burnt and eaten with rice.

Sponge gourd or Luffa (Local name *Jhingā tori*)

This is a cylindrical and somewhat club shaped gourd with sharp ribbed projections from end to end. It will grow in any soil but does well when the soil is lightly manured. The seeds are sown just before the rains set in. The sowings can be made in rows 6 ft.

apart with 1 ft. between the seeds. The vines need adequate support. Very often they are trained on walls, trees, etc. Irrigation is required every fourth day and the soil must be kept well hoed. The variety called *ghiya tori* has a smooth skin but is cultivated and used in the same way as *Jhinga tori*.

Pumpkin or White gourd (Local name *Pelha*)

This is a large egg-shaped gourd covered with a pale-greenish white waxy bloom and is very popular. It is known as *chalkumra* in Bengal. The plant is grown in light sandy soil from the middle of May to the middle of July. Small basins of about 2½ ft. diameter are prepared in the soil and some rubbish is placed in these and burnt slowly. After this a basketful of manure is added to each basin and this is thoroughly mixed along with the ash from the burnt rubbish and the whole thing well incorporated into the soil. The soil in the basin is then properly levelled and half a dozen seeds are dibbled in each basin. If the sowing is done in May the basins are irrigated and kept moist till the seeds germinate. Three to four plants are kept per basin. The vines are usually supported on a trellis or trained to spread over the thatch of the village house. Like all gourds, *pelha* responds to good manuring.

Fruiting starts in August and continues up to September. The fruits when ripe are gathered and usually hung up till required for use. White gourd is extensively used for making a sweetmeat called *pelha*.

Bottle gourd (Local name *Loki*)

This is one of the commonest of Indian vegetables. There are many varieties of this gourd with different shapes. It requires a heavily manured sandy soil and the cultivation is about the same as for pumpkins. Six to eight seeds should be dibbled in each basin and later on three to four should be allowed to remain in each basin.

It is sown just before the rains start and the sowing can go on till August in order to provide supplies of the vegetable over a long period. Fruits are ready for harvesting two months after planting.

Trailing can be done on some support and this gives well-shaped and long fruits. The yield is about 300 lb. from a plot of 1,000 sq. ft.

Pests.—It is attacked by the red pumpkin beetles and spraying may be done as in the case of the red pumpkin.

It is used for a variety of purposes, i. e. for cooking as

vegetable, for the preparation of sweetmeats, and mixed with curd for preparing '*raiyata*'.

Red gourd or Red pumpkin (Local name *Kaddu* or *Kashi-phal*)

This is a brownish red, globular-shaped, bluntly ribbed gourd and attains enormous size. It is generally cut and sold in slices in the bazar. It flourishes in a rich soil and should be grown over a trellis or outhouse during the rainy season to prevent the fruit from rotting. There are many varieties only differing from one another in size, shape and colour of the skin which ranges from greenish white to brownish red. Seed is sown in June and July. When large fruits are desired only two or three should be left on each plant. Stems of gourds take root readily. The delicate shoots and leaves of gourds are largely used in cooking and in some seasons they fetch very good prices in the market.

Pests.—The red pumpkin beetle attacks this gourd. The insects may be collected in the morning and destroyed. Spraying with lead arsenate should be practised. Two or three ounces of lead arsenate to four gallons of water to which half a pound of *gum* has been added will make a suitable mixture.

Cucumber

Rainy season cucumber (Local name *Kheera*,

It is difficult to grow cucumbers from imported seeds. Indigenous seed can be sown from the beginning of March to the end of July and the cucumbers are in season throughout the monsoon. Where irrigation facilities are available, early sowings are practised. A light rich soil is the best. The crop is of three to four months' duration.

The yield is about 170 lb. from an area of 1,000 sq. ft. The young plants are sometimes attacked by red beetles and these can be kept off by scattering ashes over the leaves.

Ghekin (Local name *Gol kheera*)

This is a variety of cucumber which is a hot-weather crop and is generally sown in March-April where irrigation facilities are available. It grows on any good soil and a little supply of manure increases the yield. It has a dwarf bushy habit and produces small fruits which are superior to the ordinary *kheera* in flavour. It provides an excellent material for salads.

Squash or Vegetable marrow (Local name *Valaiti kumra*)

There are many forms of this gourd. It likes a well-manured,

light soil. Hot-weather sowing is done as soon as warm weather sets in. The monsoon crop is not so successful as the hot-weather crop. Sowings can be made in March or in June-July, the fruiting period is May-June and August to October. Care must be taken to gather the gourds while they are tender as they rapidly become hard and woody.

Pests.—When the plants have formed four or five rough leaves they are, as a rule, attacked by the red beetle. Wood ashes may be thrown over the leaves to protect them.

Snake gourd (Local name *Chichinda*)

This is a large, greenish-white, club-shaped gourd of the length of a man's arm and about 3 to 4 in. thick. It grows very rapidly and is a popular vegetable. It will grow on ordinary soil. It is generally sown from the middle of April where irrigation facilities are available to the middle of July, 6 in. apart in rows 5 ft. wide and the vines are staked up.

Parwal

This is a small, oblong, green gourd about 4 in. long. It is generally propagated by cuttings, division of roots and seeds during the rains.

The time of sowing is from March to July in rows 2 ft. apart, the distance from plant to plant in a row being 8-10 in. The fruiting period is from May to October. It will grow on any soil but a sandy loam suits it best. The leaves and tender shoots of the creeper are in great demand in Bengal for the preparation of soups for convalescents. The male and female vines are distinct and about 5 per cent of the male plants are sufficient for the purpose of fertilization. When preparing trenches they should be filled up to within 6 in. of the tops and the plants should be grown in these shallow trenches. When the plants have grown 18 in. long the trenches should be filled in almost to the surface.

Squash melon (Local name *Tinda*)

It is generally grown in a light sandy soil and is largely used as a vegetable. The fruits are small and resemble small turnips. Two varieties are commonly grown in Delhi, viz. light green and dark green. The sowing time is June-July and the fruiting period is generally September-October. Earlier sowings may be practised where irrigation is available, in which case early crops are harvested from July onwards.

Water melon (Local name *Tarbooz*)

It has already been stated in the introduction that the cultivation of melons and squashes is largely practised on the Jumna river bed. *Tarbooz* is successfully grown on the slightly sloping gravelly bank of the river. Sowings are made from the middle of January till the end of March. Patches of soil 5 ft. apart are well manured and a seed set in each. The fruits are ready in the hot dry months.

Melon or Marsh melon (Local name *Kharbooz*)

The heavily manured soil of the dry river bed suits this plant. Seeds are sown from the middle of January to the middle of March in pits 4 ft. apart. The fruits when half grown are oblong, green and downy and these are then picked. Later on they become smooth and yellow. The fruiting period is from April to June.

Snap melon (Local name *Phool*)

This is eaten as a vegetable when raw and as a fruit when ripe. A light though well-manured soil suits it. It can be sown either in February-March, or in June-July in rows 5 ft. apart, the distance from plant to plant in the row being 4 ft. The fruiting period is May to July and September to October.

Hot-season cucumber (Local name *Kakri*)

It is generally sown from February to April in rows 4 ft. apart, the plants in a row being 3 to 4 ft. from one another. The fruiting period is April to June. The variety is indigenous. This, as also the rainy season cucumber or *kheera*, is largely eaten uncooked when young. Both can, however, make palatable dishes when cooked.

D. FRUIT VEGETABLES**Ladie's finger (Local name *Bhindi*)**

This vegetable is very common in Delhi and grows to about 3 or 4 ft. The erect, horn-like green pods when cooked provide excellent dishes. There are several kinds of tall and dwarf varieties. The dwarf kinds are the earliest and are, therefore, preferred. About 2 oz. of seed will sow 100 ft. of drill. Half a cartload of farmyard manure is sufficient for 1,000 sq. ft. and is applied at the time of preparing the land. Seed may be sown at any time during the rains and the plants are placed 2 ft. apart. Sowings can also be made in February-March if a good source of irrigation is available nearabout. Any ordinary garden soil suits *bhendi*. During the hot weather, irrigation should be given at an interval of

four to six days while no irrigation is required during the rains. Proper weeding and interculture should be done.

Harvesting commences six to seven weeks from sowing and the yield is 100 to 150 lb. from a plot of 1,000 sq. ft. The pods are plucked when they are young and soft as otherwise they become too stringy for table use.

Diseases.—Some plants often turn yellow and pale due to the attack of white fly. These should be pulled out and burnt. Pods allowed to ripen in a few plants set aside for the purpose will provide sufficient seed for the next year.

Varieties.—Pocha's American Long green is a good variety. The indigenous varieties commonly grown are the *chikni* or the smooth and the hairy podded.

Brinjal (Local name *Baigan*)

This is another very common vegetable grown to perfection in Delhi. There are many varieties different in size, shape and colour of the fruit. The purple-coloured varieties are preferred for the table. The two varieties commonly grown round about Delhi are (a) the *Batiya* (long), and (b) *Mari* (round) or *Gola*. It is usually sown several times during the year in the early summer, during the rains and about the middle of October and in this way the vegetable is in season throughout the year. High well-drained sandy loam or garden soil not too rich in organic matter suits this crop best. Excess of organic matter gives rise to leaves at the expense of flowers. The plants should be raised in seedbeds and transplanted and to ridges 18 in. apart, the distance from plant to plant in a ridge being 15 in. Top-dressing with groundnut cake is useful. The land can also be marked out in squares of $2\frac{1}{2} \times 2\frac{1}{2}$ ft. to which seedlings may be transferred at each cross in the rainy season. The seed rate is about $\frac{1}{4}$ oz. for an area of 1,000 sq. ft. Ten square feet of seed-bed area is required for planting a plot of 1,000 sq. ft. and seeds are sown in beds four to five weeks before the actual date of transplanting.

Irrigation should be done immediately after transplanting. A second irrigation is given on the third day after transplanting. Later on irrigation should be given when required. Excess of water is harmful to this crop. Fruiting starts after about 12 weeks. Well-developed fruits should be harvested. The yield is about 400 lb. of fruits from a plot of 1,000 sq. ft. The most productive plants are raised from October sowings.

Varieties.—Sutton's Long Purple and Improved Round are good varieties to grow. Cooper's or Pocha's Improved New York

Spineless, Large, Purple Type is a good variety to grow. Cooper's Early Black Beauty can be grown for early markets. Pekin Black (Giant) produces large, round fruits of superior flavour. Its seed can be obtained from Pochas.

Chillies (Local name *Mirch*)

Delhi province grows chillies on a fairly large field scale, specially near Narela, which is a famous market for chillies.

Of this vegetable there are many varieties cultivated extensively throughout the country. Those with large fruits are called capsicums and are mild in flavour while the smaller kinds are known as chillies and are very pungent. Among the farmer some very ornamental varieties are found and also those which are suitable for pickling.

Any good soil suits chillies though they prefer a light brown to medium black soil. Preparation is the same as for other vegetables and manuring is at the rate of half a cartload of farmyard manure for a plot of 1,000 sq. ft. Half an ounce of seed will suffice for a plot of 1,000 sq. ft. Raised seed-beds are best. To transplant an area of 1,000 sq. ft., 10 sq. ft. of seed-bed area is sufficient. Seeds are sown in the beds in May-June and the seedlings are ready for transplanting in a month's time, i.e. when they are 6 in. high in the bed. After transplanting, chillies require very little attention except weeding and regular watering. December to February is the proper harvest season for ripe chillies. Green chillies, however, can be had from September onwards if there is a market for green chillies.

The yield of dry chillies is about 25 lb. from a plot of 1,000 sq. ft. If plucked green, the yield is about 150 lb. of green fruits from a plot of 1,000 sq. ft.

Varieties.—Some good varieties to grow are sutton's Colossal, Spanish Giant and Golden Queen.

E. SALAD VEGETABLES.

Lettuce (Local name *Salad*)

There are two kinds of lettuce namely (1) the cabbage-like lettuce and (2) the Cos lettuce, and each has a number of sub-varieties. The Cos types is long and upright. With this vegetable the greatest care is required in obtaining superior seed. Seeds may be sown in August and sowing may continue up to October. The seeds are small and in many cases germination of all the seed takes as long as one month. It is very liable to insect attack.

It requires a light soil made mellow by mixing it with leaf mould and sand.

A quarter of an ounce of seed is sufficient for 4 sq. yds. The most delicate leaves are generally obtained from plants which have not been transplanted. When transplanted, the rows may be 1 to 1½ ft. apart, the distance from plant to plant being 1 ft.

The harvesting period is from October to March. Plants may be assisted to form heart by tying the outer leaves together. The secret of success with lettuce is to let it grow without check from the very start. For this they should never suffer from want of water. Bone-meal at the rate of 2 oz. to a square yard is beneficial.

Mustard (Local name *Rai*)

Not much direction is required for the cultivation of this simple vegetable. The seed can be sown broadcast thickly in a small piece of ground any time in the cold weather beginning from October. The seedlings are up in two or three days and shortly afterwards continue to supply cuttings for a salad. If sown in rows the line should be 6 in. apart. Although it is a winter crop, mustard can be sown on a small scale for home requirement at any time in the year. If small quantities are required the best plan is to sow in boxes. Delicate mustard leaves provide a favourite vegetable throughout the season. The *sag* is very popular and in the season it is fried and eaten with *chapati* made from maize flour.

Tomato (Local name *Viluti baigan Tomatur*)

The cultivation of this plant generally resembles that of brinjals. Sowings can be made from July to October but this crop is now grown in Delhi almost throughout the year. Tomato should be grown in an open situation as light and air are essential for the production of sound fruit. The plant must have support as they come into fruit. The tomato is not very exacting in its soil requirements but a medium loam is the best.

The seed rate is about ½ oz. for a plot of 1,000 sq. ft. Raised seed-beds are preferred. A 9 sq. ft. seed-bed will provide enough seedlings for a plot of 1,000 sq. ft. Seeds are sown in the bed a month before planting. If sown on a field scale ¾ sr. of seed sown in a plot of 1/160 acre gives enough seedlings for planting an acre.

Transplanting.—The seedlings should be planted out in rows 3 ft. apart and 18 in. between plants in well-prepared soil.

Irrigation is required if there is ~~no rain~~. Weeding should be attended to when necessary. ~~Everything~~ ~~should~~ ~~be~~ ~~done~~ ~~before~~ flowering.

The harvesting period is from October to April. Fruits which change colour from green to red should be harvested. They should not be allowed to ripen completely on the plant because if allowed to do so they get spoilt in handling.

Yield.—This is about 200 lb. from a plot of 1,000 sq. ft. On a field scale 250 md. per acre of ripe tomatoes can be taken as an average outturn, though a good crop yields much more than this.

The plants are sensitive to frost.

Varieties.—Sutton's Golden Perfection and Golden Queen are improved strains for yellow fruit. Sutton's Best-of-All and Perfection are popular red varieties to grow. Cooper's Mar Globe gives good globe-shaped scarlet fruits. Cooper's Trophy is an extra-early variety.

Celery (Local name *Shalari* or *Kurass*)

This vegetable is of two kinds: white and red, and under each there are several varieties. It loves moisture and therefore the place selected for growing it should be close to the water supply. As in the case of lettuce, the perfection to which celery may be brought depends in great measure on the quality of seed. It is generally sown in July-August, i.e. early, because it takes a long time to complete its growth.

The earliest sowings are the best. Half an ounce of seed is required for 8 sq. yds. This produces 2,500 to 3,000 plants. The seed takes a long time to germinate—sometimes a month to a month and a half. When the seedlings are large enough, they are transplanted into trenches very highly manured with a large quantity of farmyard manure and leaf mould mixed with some sand to a depth of a foot or more. On this a few inches of a good loamy soil is placed and gently firmed down. Seedlings are placed on this a foot apart. They are kept frequently watered.

The harvesting period is from January to March. Of all vegetables it is with celery that the amateur appears to have the least success. This is due to the erratic germination of the seeds. It is good to remember that the essential condition for successful germination is cool weather. Therefore, the most favourable time to sow (under cover) is at the beginning of a long cool spell of rainy weather. Sown under this condition seeds are almost sure to germinate satisfactorily. Every endeavour must be made to sow during the favourable weather and successive sowings should be made at suitable opportunities throughout July and August.

After-care.—Foliage is tied into a loose heart and the soil

carefully hoed up around the stock as the plant grows. Straw envelopes may be tied round each plant to blanch the foliage. Great care should be taken in watering to see that no water collects in the hearts of the plants or else rotting will start.

Yield.—This is about 600 lb. from a plot of 1,000 sq. ft.

Varieties.—Cooper's Mixed Celery can be grown to supply the home table continuously throughout the season. Sutton's Solid White is a very good white celery for the main crop.

Celeriac is a form of celery having roots like turnip. It is cultivated in the same way as celery but does not require earthing up.

Cress (Local name *Halim*)

This is easily grown in any soil enriched with leaf mould. Sowings can be made from September to February and the leaves are ready for cutting a few days after sowing. Half an ounce of seed is sufficient to sow three square yards.

Sutton and Carter offer packets of both curled and plain types. Copper's Extra Curled is a variety with an agreeably pungent taste and can be taken as a salad either alone or with lettuce.

F. LEAF AND STEM VEGETABLES

Cabbage (Local name *Bund gobi*)

In its numerous varieties cabbage can be sown during September and October.

Soil.—It prefers a sandy loam to clay loam which is not very rich because this promotes coarseness.

Cultivation.—Land should be ploughed to a depth of 1 ft., clods properly broken and the soil brought to a fine condition.

Manuring.—Well-rotted farmyard manure is best. It should be applied at the rate of half to one cartload for a plot of 1,000 sq. ft. at the time of preparing the land. On a field scale 15 md. of manure per acre can be applied.

Sowing.—Seed is sown in seed-beds towards the end of the rains and sowing may be continued for two months to get successive crops. When the seedlings are 4 in. high they are transplanted in rows 2 ft. apart, the distance between two plants in a row being also 2 ft. A quarter ounce of seed will be sufficient for 8 sq. ft.

Irrigation.—Irrigation should be given once in four days and the soil may be well hoed. Early sowings are liable to be affected by heavy rains and, therefore, planting should be done on ridges.

After-care.—Weeding and hoeing should follow as far as possible after every irrigation and when the plants have developed a foliage a foot in length earthing up of the base is essential to ensure good results. Old leaves should be removed frequently. Cabbages get ready in three to three and a half months and give a yield of about 300 lb. from a plot of 1,000 sq. ft.

Varieties.—The Savoy cabbage is an excellent compact type with crumpled leaves and dense heads, and stands the heat well. The sugar leaf varieties have conical heads. Drum Head is another variety which produces fine sweet leaves. Red cabbage is mostly used for pickling.

Pests.—Cabbage and cauliflower are attacked by caterpillars of different insects. For these dust the leaves early in the morning with a dry mixture of ash and a little kerosene oil. The caterpillars may be caught and destroyed. Against aphides, spraying of tobacco dust extract is recommended.

Cauliflower (Local name *Phool gobhi*)

This is a highly prized and popular vegetable.

Soil—The land for this vegetable requires heavy manuring and thorough working. Half an ounce of seed will be needed to sow 8 sq. yards and will give 800 plants.

Sowing.—In Delhi province there is a strain of cauliflower known as *Kathki* of which the seed is sown in June, transplanted in July and the crop is ready in October. There is another strain known as *Mahi*, which is sown in July, transplanted in August and gives a crop from November to January. Seeds for both of these varieties are produced in Delhi province itself. Imported seeds can be used for sowing in September, transplanting in October and growing a crop up to April. The seedlings should first be transplanted from the seed-beds to raised nursery beds and from there to the open ground. Checking the growth of the seedling by careless transplanting should be guarded against. Cauliflowers are ready in $3\frac{1}{2}$ to 4 months and the average outturn of a medium crop is 150 md. of heads per acre. The plants from imported seed require great care and attention but as they are grown during the more favourable weather they are not difficult to manage. The slightest check from drought, poverty of soil, careless transplanting, thick sowing or delay in transplanting affects the crop. It also requires proper rotation with other vegetables.

Knoi-Kohl or Kohl-Rabi (Local name *Ganth gobhi*)

The swollen succulent stems of this vegetable are eaten. Green and purple varieties differing little in quality are cultivated. It can be sown from the middle of August to October. A light soil is used to raise the seedlings and when these are large enough they are transplanted to very rich soil 15 in. apart. The plants should be watered freely and the roots should not be earthed up. The soil should be kept free from weeds and properly stirred up.

For cultivation the same directions apply as for cabbage except that the plants may be put out somewhat nearer to one another. It takes about six weeks to two months to be ready for harvest, and is the earliest European vegetable to come into the market. Three-quarters of an ounce of seed are sufficient for a plot of 1,000 sq. ft. If grown on field scale $\frac{3}{4}$ sr. of seed sown on an area of $\frac{1}{100}$ acre will give enough seedlings for one acre of land.

The yield is 20 to 25 per cent less than that of cauliflower.

Onion (Local name *Piyaz*)

There are local races of onion which have developed; one commonly grown is the large, red onion and the silver skin variety is grown to a much lesser extent. Onion seed deteriorates very quickly and should be sown as fresh as possible.

Soil.—A high sandy soil is decidedly the best.

Tillage.—The land is ploughed or dug to a depth of 8 in. clods broken and the seed-bed made firm. Half a cartload of well-rotted farmyard manure should be thoroughly mixed with the soil in a plot of 1,000 sq. ft. at the time of the preparation.

Seedlings.—Four ounces of seed should be sown on 50 sq. ft. of seed-bed for a plot of 1,000 sq. ft. Raised seed-beds are preferred. The seedlings get ready within five weeks.

Sowing.—Sowings for green vegetable are made in June-July and for vegetables and bulbs in October and November.

Transplanting. The land is laid out into beds of 10 ft. x 10 ft. or 12 ft. x 6 ft. or into ridges and furrows 18 in. apart. After preparing the land irrigation is given before transplanting and seedlings are transplanted at a distance of 4 to 5 in. in the line, the lines being 9 in. apart. In the ridges and furrows seedlings are transplanted on both the sides of the ridge about half way up.

Irrigation.—This can be given again just after transplanting. Further irrigations are given once in 10 to 12 days.

After-care.—Weeding is done when necessary. Stirring of the soil should be done after each irrigation. Top-dressing with oil-coke is useful. Watering is stopped some time before harvesting. When the leaves have completely withered the bulbs are ready to be taken out.

Harvesting.—This is done with a *kudali* and after digging, the tops and roots are cut off.

Yield.—The average is 600 lb. from a plot of 1,000 sq. ft.

Other points.—For pickling onions should be grown close together, i. e. about 3 to 4 in. apart each way. For seed purposes, bulbs should be planted in rows 18 in. apart and 1 ft. from each other in October.

Only sound, well shaped bulbs should be selected. The tops should be cut off with a sharp knife and the lower two-thirds should be taken for planting, this gives stronger flower shoots.

Garlic (Local name *Lahsan*)

This vegetable is always obtainable cheaply and it is perhaps unnecessary to grow it in one's garden. It consists of several small so called cloves or bulbs. These cloves are planted in October and November 6 in. apart in sunk beds so as to allow of irrigation. The soil should be light though fairly rich. The crop is ready to be taken up by February. Watering should then be withheld for a few days, the bulbs dug up, dried in the sun and stored.

Brussels sprouts (Local name *Broisai*)

This is another sub-division of the cabbages and needs a rich soil. It does well on a firm seed-bed. Three-fourths of a cartload of farmyard manure can be applied to a plot of 1,500 sq. ft. at the time of preparing the land. Seedlings are raised from seed sown in the nursery on raised seed-beds. Seedlings are ready within four weeks. August to October is the time for sowing seeds. One ounce of seed will produce about 1,500 plants. The plants should be 2 ft. apart in the field and require earthing up as they grow, as also a liberal supply of water. The sprouts are gathered before the head is out. The lowest sprouts should be gathered first. A well-grown plant will produce 50 to 100 sprouts.

Spinach (Local name *Palak*)

There are two varieties—the prickly seeded, with triangular leaves and the smooth seeded with round leaves. It provides a very wholesome vegetable. Well-cultivated rich soil with abundance

of moisture is liked by spinach. It requires a shady situation and should be sown in drills and thinned out to about 6 in. apart. The rows should be 12 to 18 in. apart. Half an ounce of seed will suffice for a row of 50 ft. The plant takes six to eight weeks to mature. It can be sown throughout the year provided there is abundance of water for irrigation, though the usual time is during the monsoon. The outer leaves only should be gathered and those in the centre left for future picking. By doing this the plants last much longer and yield much more than they would do if the central leaves were picked at once.

Amaranthus species of this provide the vegetable known locally as *sag* and *lalsag*.

There are several varieties of which the green-stemmed and the bright red-stemmed are popular. In addition to the stems and leaves, the soft succulent roots of these, as also of spinach, are used in cooking. These vegetables are available for use during the rains.

Basella or the climbing spinach (Local name *Poi sag*)

This is a climbing vegetable with very succulent stems and leaves which are used much in the same way as spinach. It is liked specially by Bengalis and bundles of *poi sag* fetch good prices in the New Delhi vegetable market. It is a perennial climber and can be trailed against walls. It is propagated by seed during the rains or by root or stem cuttings taken from old plants during the rains.

Portulaca-leaf spinach (Local name *Kulfa sag*)

This is a dwarf creeping vegetable and is sown from March to June. It provides an inferior *sag* which is relished by some on account of the acid flavour.

G. FLAVOURING AND SEASONING VEGETABLES

Ginger (Local name *Adrak*)

Planting is made in June and July in rows 1 ft. apart, the tubers being 9 in. from one another. The depth of sowing should be 3 to 4 in. in light rich soil. As the plant grows it should be slightly earthed up and the earth around the roots should be well cultivated and dug so as to be loose and allow of the expansion and growth of the tubers. It is hardly worth while to cultivate ginger in a garden for ordinary use because it can always be purchased cheaply from the bazar. If, however, it is required for making a preserve, ginger can be grown in small plots and the tubers taken up as

early as possible after being formed in their young and tenderest condition. This will be when the plants are not more than 5 or 6 in. high.

Mint (Local name *Podina*)

This is usually planted in October and is propagated by plucking up the old plants. It needs a somewhat heavy soil and is luxuriant in a shady position. It can grow for several years in the same situation, but it is better if it is taken up annually and replanted. The plants are generally put in at intervals of 6 in. in rows 1 ft. apart.

Parsley (Local name *Ajmur*)

This thrives in any soil in a shady situation. It is generally sown from September to November. The curly leaf varieties are the best and should be planted in rich soil well manured with leaf mould and farmyard manure. The seed germinates in ten days and when the plants are 3 or 4 in. high they may be planted out in a row about $\frac{1}{2}$ ft. apart and kept well watered.

Fenugreek (Local name *Methi*)

Tender and smooth leaves are used for flavouring and stems and leaves are cooked and eaten as a *sag* like spinach. Sowing can be done any time in the year in small beds, though the usual period is October-November. When grown on a field scale, 40 to 50 lb. per acre of seed can be sown by broadcasting. The seed are then mixed with the soil with the help of a rake so that these are well covered. Watering should be done pretty frequently, specially in the hot weather. The crop gets ready for leafy vegetable after about four weeks from the time of sowing. The yield is from 4,000 to 5,000 lb. per acre.

Coriander (Local name *Dhania*)

The leaves of this vegetable are generally used for flavouring *dals*. They are also used in the preparation of salads. It can be sown any time in the year in small beds for house hold purpose but the usual time for sowing is September-October.

Papaya (Local name *Papeeta*)

Papaya fruits, though largely eaten when ripe, are also used as a vegetable when green. Papayas are easily grown and can be planted as useful border trees in the compounds of houses in Delhi. The papaya is propagated by seeds. It is sensitive to waterlogging. Plants raised from seeds are ready for transplanting to the field in

APPENDIX

The following is a partial list of suppliers of vegetable seeds:-

- Amin Nursery, Bombay.
- Carters Tested Seeds, 19, Convent Road, Calcutta.
- N. Cooper & Co., Wellesley Road, Poona.
- Dagga & Co., Quetta.
- Empress Gardens, Poona.
- Globe Nursery, Calcutta.
- Government Botanical Garden, Lalbagh, Bangalore.
- Hobbie & Co., Nurseryman, Ghugudanga P. O., Calcutta.
- L.R. Bros., Sahmampur.
- Pestonji P. Poocha & Son, Seed Merchants, 8, Napier Road, Poona.
- Palikar & Co.,
- Seedsman, Sitaram Buildings, Near Crawford Market, Bombay.
- Sutton & Sons, Ltd., 13-D, Russell Street, Calcutta.
- Rai Sahib Kashi Ram, Sahmampur.

In preparing this guide for those interested in vegetable growing in Delhi, free use has been made of the following references and these are gratefully acknowledged. The publication claims no originality and in its preparation the central idea has been to pool together useful information on vegetable growing from various sources:-

- Gardening in India* by Firminger, Thacker Spink & Co., Calcutta, Rs. 10.
- Annual Administration Reports of the Delhi Province, Chief Commissioner, Delhi, Re. 1.
- The Indian Amateur Gardener*, by Landolius, Newman & Co. Calcutta.
- Bulletins Nos. 60 and 70 of the Department of Agriculture, United Provinces, Supdt. Govt. Printing, U. P., Allahabad, as 4 and as. 6 respectively.
- The Bombay Agricultural Department Leaflet, *Hints on Vegetable cultivation in the Bombay Province*, Supdt. Govt. Printing, Bombay.
- Handbook of Indian Agriculture* by Mukerjee, Thacker Spink & Co., Calcutta.
- Some Aspects of Rural Economic Conditions in Delhi Province* by Radhika Narain.
- Suggestions offered by the Agricultural Assistant, Delhi, are also acknowledged with thanks.